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(56) Documents cited
GB 1418045 A EP 0398784 A1 WO 84/00930 A1
DE 003722676 A1

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W.P.I.

(54) Light refracting air spoiler

(57) A transparent rear air spoiler for a vehicle refracts light and allows the driver's visual field to be extended to include the blind spot normally offered by the bodywork at the rear of the vehicle. The design consists of a series of prisms or lenses added to reduce reflected light. The optical system can be designed to eliminate the blind spot caused by the addition of this second spoiler.

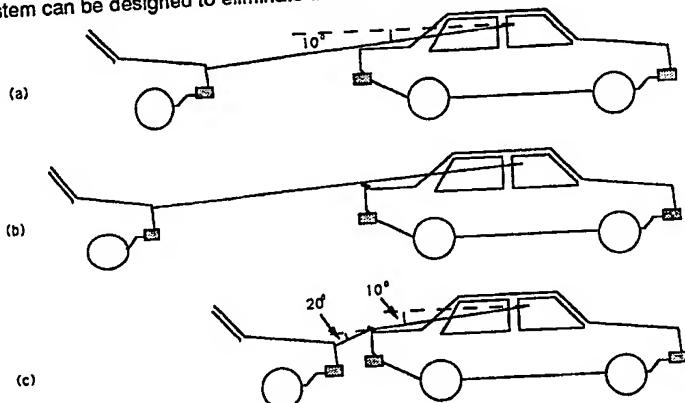
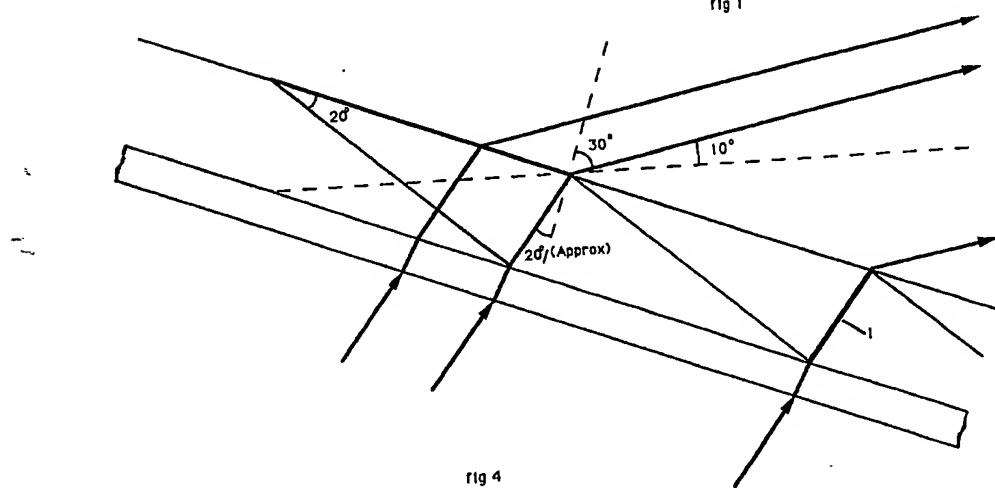


Fig 1



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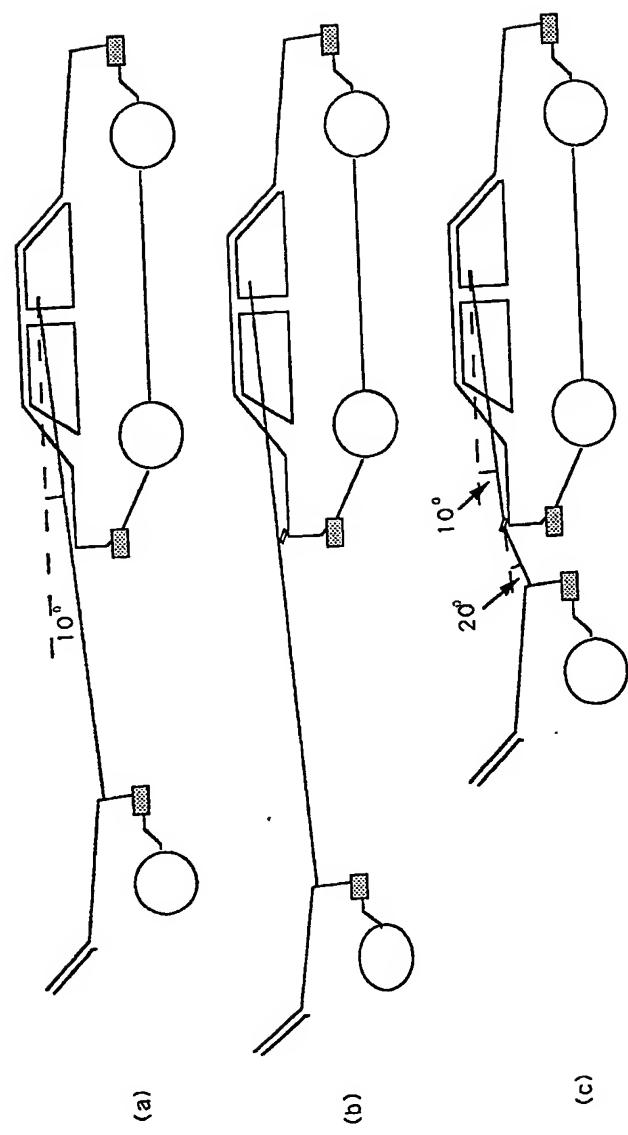


fig 1

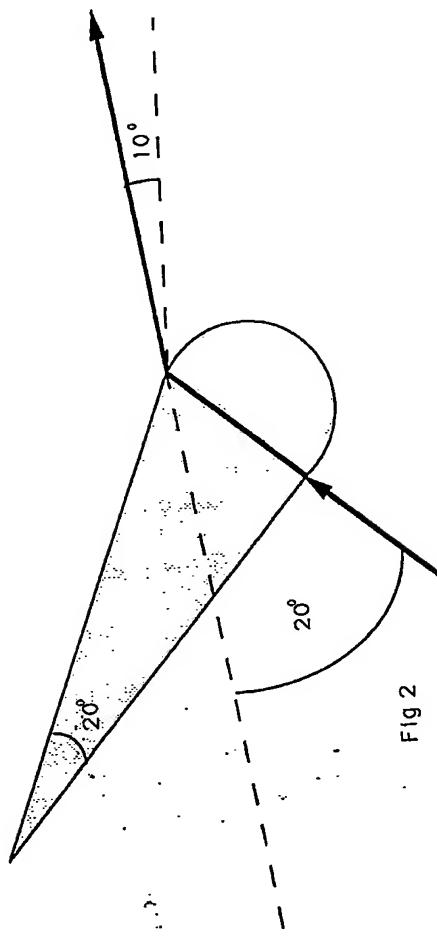
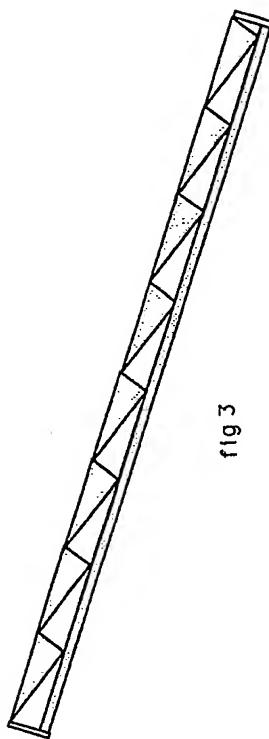


fig 3



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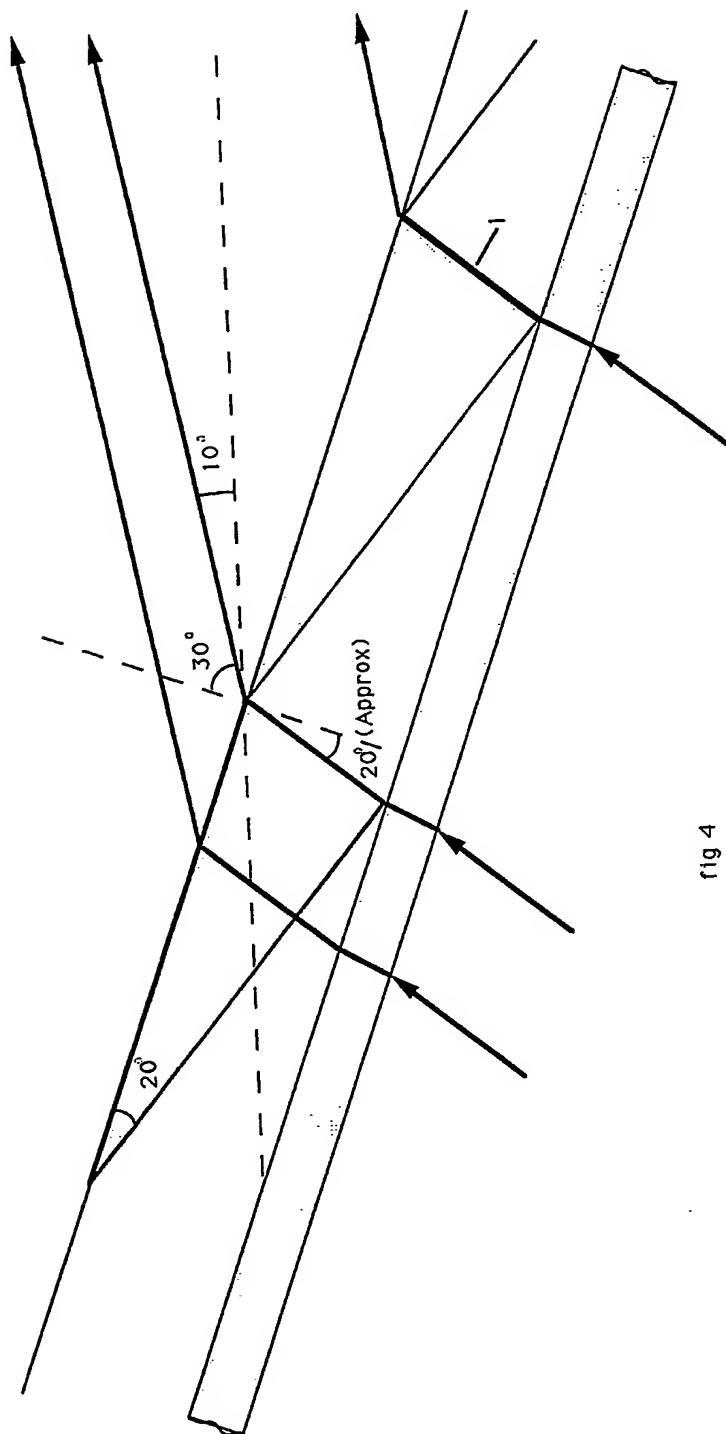


fig 4

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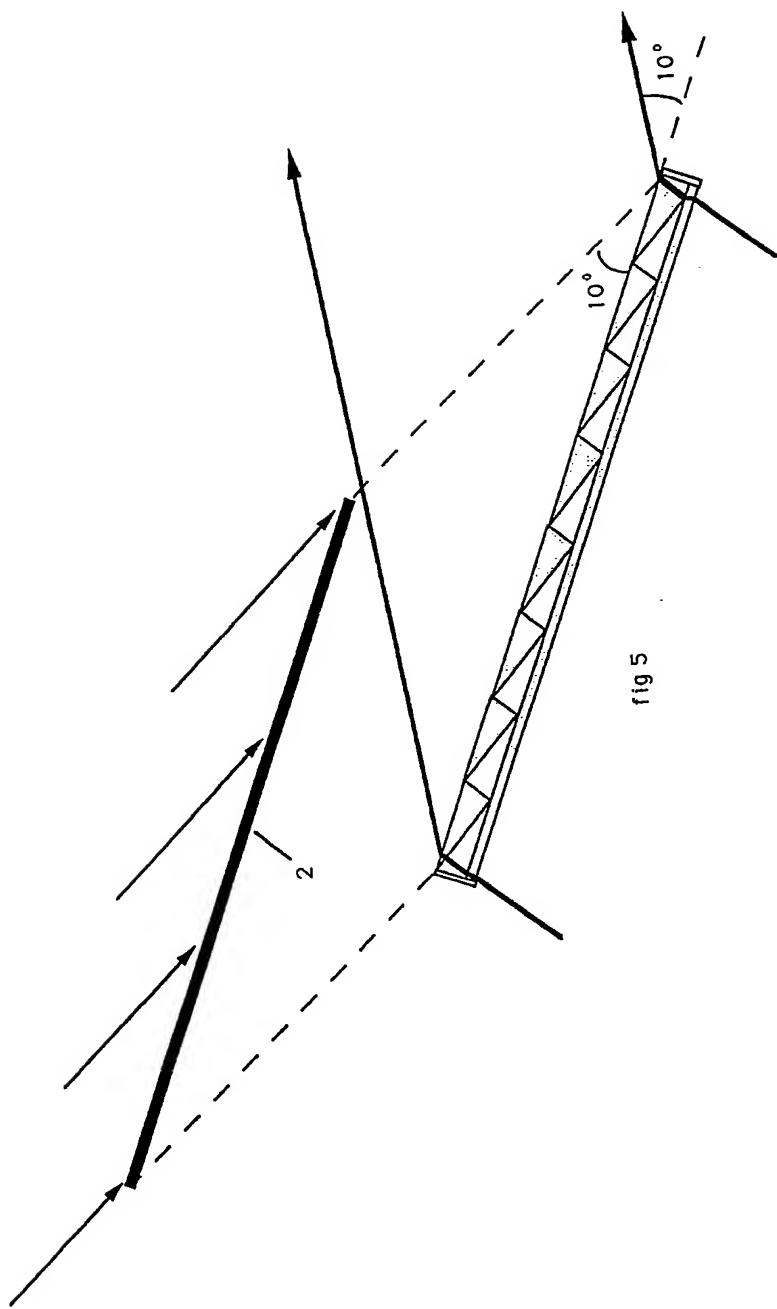


fig 5

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Light Refracting Air Spoiler

This invention relates to road vehicles. It is a rear air spoiler that also acts as a reversing and parking aid.

The bodywork at the rear of a vehicle (boot, rear door etc.) limits the drivers field of vision when reversing the vehicle. The addition of a rear air spoiler often reduces the field of vision further.

By adding a transparent air spoiler that refracts light it is possible to see the area normally hidden by the bodywork. The refraction can take place using a solid, single piece spoiler, having a prism shape in cross section or have a more complex design.

One version of the invention can produce refraction using a thin (several mm) composite of optical material. It uses a number of small prisms or lenses in a manner similar to that originally proposed by Fresnel (1788-1827). The transparent spoiler consists of two sheets of material, an upper and lower sheet. The external surfaces of both sheets are smooth, to minimise the accumulation of dirt or water. One sheet, upper or lower, is moulded so that its internal surface takes the form of the prisms or lenses. The other sheet can consist simply of a transparent, parallel sided lamina and serves the purpose of protecting the moulded surface. The upper surface (and other surfaces as well, if necessary) can be coated with an anti-reflecting layer, to reduce the reflection of unwanted light towards the drivers eyes.

A second, opaque upper spoiler can be added to assist in eliminating unwanted reflected light. The blind spot caused by the addition of the second spoiler can be eliminated by having a range of prisms or lenses to give a similar effect to that produced by a diverging lens.

The specific shape and angle of the spoiler to produce the required airflow effects will depend on the shape of the vehicle and other design requirements. The purpose of this patent claim is to describe the optical features that can be incorporated to assist in reversing and parking.

A specific embodiment of the invention will now be described.

For simplicity and clarity it will be assumed that the spoiler consists of a flat plane parallel to the rear axle and mounted at an angle of 20° to the horizontal. The driver will be assumed to view the spoiler from an angle of 10° to the horizontal and the design will produce a refraction of the light of 20°.

Fig 1(a) shows a typical closest distance at which the front of the bonnet of another car can be viewed without the addition of a spoiler.

Fig 1(b) shows the effect of adding a traditional opaque spoiler.
Fig 1(c) shows the effect of adding a transparent spoiler that refracts the light through an angle of 20°.

Fig 2 shows how a simple, solid prism can be used to produce the required amount of refraction. The diagram shows the refraction that would be produced for the angles shown, using a transparent material of refractive index 1.5. The calculations of the angles are carried out using the standard formulae for geometrical optics described in Physics textbooks. The curved area at the front (right hand side) will have a shape that is defined by aerodynamic considerations.

Fig 3 shows a cross section of a spoiler that produces the same degree of refraction using a number of mini prisms. The diagram assumes for simplicity that the refraction is produced by prisms. The plane inner surfaces could be curved-i.e. they would be described as lenses. The prisms are shown on the upper layer, instead the required refracting could take place on the lower layer or be shared between both layers. For simplicity the arrangement is shown to consist of a small number of large prisms. The spoiler can be made thinner by using a large number of smaller prisms (lenses)

Fig 4 is a more detailed version of a section of fig 3. The useful refraction produced is similar to that shown in fig 2.

The surface 1 of the prism, labeled in the diagram, is parallel to the refracted ray inside the prism, for an emergent ray viewed from an angle of elevation of 10°.

Notes

a) Angular dispersion could be corrected by using systems consisting of prisms (lenses) of different dispersive powers and refractive indices in sequence. An alternative solution is to tolerate a small amount of coloured fringes caused by dispersion and minimise this by choosing a transparent material with a low dispersive power.

b) This diagram shows the shape of prism and geometry of the rays for a cross section directly behind the driver. The same physics principles apply as the driver looks diagonally across, towards the back of the vehicle but the diagram becomes more complex. The shape of the prisms (lenses) could be varied along a line parallel to the rear axle of the vehicle to reduce distortion of the image as seen from the driving position.

Fig 5 shows the addition of a second opaque spoiler to reduce the amount of unwanted reflected light entering the drivers eyes. The second spoiler is labeled as 2.

The amount of reflected light can also be reduced by adding an anti-reflecting coating to the optical surfaces.

CLAIMS

1. A transparent rear air spoiler that gives visual assistance when parking a vehicle.
2. A system of one or more prisms or lenses that can be built into the spoiler to refract light.
3. A Fresnel lens/prism design that can be built into the refracting spoiler to reduce its thickness.
4. A multiple layer transparent spoiler that offers smooth outer surfaces.
5. A spoiler with anti reflecting surfaces that assists in reducing unwanted reflected light.
6. A second, opaque spoiler that assists in reducing unwanted reflected light when viewing the transparent spoiler.

Patents Act 1977
Examiner's report to the Comptroller under
Section 17 (The Search Report)

Application number 9107243.9

Relevant Technical fields	Search Examiner
(i) UK CI (Edition K) B7J, B7B (BPF)	COLIN THOMPSON
(ii) Int CI (Edition 5) B60R, B62D	
Databases (see over)	Date of Search
(i) UK Patent Office	23-09-91
(ii) WPI	

Documents considered relevant following a search in respect of claims

1-6

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	DE 3722676 A1 (WIDENKA) see especially figure 1	1, 2
X	EP 0398784 A1 (AUTOMOBILES PEUGEOT) whole document relevant	1
A	WO 84/00930 A1 (FOX) see especially figure 5	1, 2, 3
A	GB 1418045 (DONNELLY MIRRORS INC) see especially figures 18 and 19	1, 2, 3

SF2(p)

2MSAAX

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

Y: Document indicating lack of inventive step if combined with one or more other documents of the same category.

A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).